

CHAPTER

7

Mathematics Education, Language Policy, and English Language Learners

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SINCE 2004, researchers in the Center for the Mathematics Education of Latinos/as (CEMELA) have been studying issues related to the interplay of culture, language, and mathematics teaching and learning with Latino and Latina students. One of the topics of study is how different language policies may affect students' participation in mathematics education, as well as that of their parents. Acosta-Irrique et al. (in press) address the impact of two very different language policies, one in Arizona and one in New Mexico, on Latina mothers' engagement in their children's learning of mathematics. The New Mexico Constitution endorses bilingual education. Arizona, however, severely restricted bilingual education in 2000 by passing Proposition 203, inspired by California's Proposition 227, passed in 1998. Since Proposition 203's passing, Arizona has required its public schools to place English language learners (ELLs) in Structured English Immersion (SEI) classrooms, where instruction is only in English and teachers are allowed to use a student's first language only for clarification (Combs et al. 2005).

An assumption behind Proposition 203 was that after one year of SEI, students would have acquired enough English to be academically successful. Experts in second-language acquisition do not support this assumption, indicating instead that acquiring academic English takes much longer than one year (e.g., Cummins [2000]). The linguistic consequences behind this law's passing need to be interpreted from a political viewpoint as well as an opportunity-to-learn consideration. For example, one possible educational outcome associated with restrictive language policy is *subtractive schooling* (Valenzuela 1999), which strongly discourages and often prohibits ELLs from using their first language, thus risking its loss.

Moreover, in the public discourse—as reflected, for example, in comments by the public in general in newspapers, blogs, and so on—it is hard to separate a proposition that apparently addresses only the language of instruction from the political ramifications of whose opportu-

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nity to learn it affects the most. As Varley Gutiérrez (2009) writes, "[A]lthough this legislation [Proposition 203] is focused on restrictive *language* policies, it reflects a national trend at the time of this study, toward policies and practices marginalizing the growing Latina/o population in the United States" (p. 95). Wright's (2005) analysis of Proposition 203 argues for a political motivation behind this initiative rather than a real concern for the education of ELLs. The discussion needs to refocus on matters of opportunity to learn, rather than on ideological debates about language.

This chapter focuses on the intersection of research, practice, and policy in teaching mathematics to, and the mathematics learning of, Latino ELL students in Arizona. Mathematics educators, including this chapter's author, have seen the effect of a language policy such as Proposition 203. The chapter will briefly describe cases that illustrate how research, school practice, and language policy interacted as sites of discovery to guide CEMELA discussions of opportunity to learn mathematics. The cases follow three themes: placement decisions in mathematics classes; language, mathematics, and subtractive schooling (Valenzuela 1999); and the complexity of language ideology in the mathematics classroom. Before discussing the cases, the chapter will examine some background on the history of CEMELA. Specifically, it will focus on the research framework driving the center's theory of action and the structure of the partnerships that support programmatic efforts. This background information is relevant because the cases are outcomes of CEMELA's theory of action.

Situating the Work: A Brief Overview of CEMELA

CEMELA is a center for learning and teaching, started in 2004 and funded by the National Science Foundation. Its primary mission is studying the interplay of mathematics education and the unique language, social, and political issues that affect Latino communities. A consortium of four universities in partnership with several school districts, CEMELA carries out research and practice in four different settings—borderlands, migrant agricultural, rural, and urban. The focus is primarily on Mexican and Mexican American communities. CEMELA grounds its research in a sociocultural perspective with a particular emphasis on community knowledge (Civil 2007; González, Moll, and Amanti 2005) and language (Khisty and Chval 2002; Moschkovich 2002, 2007).

A primary concept in CEMELA's research is *funds of knowledge* (González, Moll, and Amanti 2005), which underscores the linguistic and cultural resources in Latino communities that can support children's learning in school. CEMELA approaches the mathematics education of Latino and Latina students holistically, through a research agenda based on working with teachers, parents, and students. Thus, CEMELA's research studies are action-based in that they (1) work collaboratively with the interested parties toward developing mathematically rich learning environments and (2) build on the experiences and backgrounds of children and families.

CEMELA's work with teachers and parents combines explorations of mathematics with discussions about teaching mathematics to, and the mathematics learning of, Latino and Latina children (Civil 2009) with an emphasis on challenges and affordances. CEMELA's work with students takes place in two settings—classrooms and after-school mathematics clubs. Turner,

Celedón-Pattichis, and Marshall's (2008) study of three kindergarten classrooms underscores the importance of using classroom practices that build on children's cultural and linguistic resources. Their study is a powerful example of opportunity to learn (Tate 2005), because we see students participating in mathematical discourse and using multiple strategies to solve complex arithmetic problems. This study took place in bilingual classrooms where the use of students' home language, Spanish, was encouraged and supported. In contrast, Civil (2008c, 2009) and Planas and Civil (2009) address the challenges to participation in mathematical discourse in classrooms where the use of one's home language, by law, is not supported. This chapter will illustrate some of these challenges.

CEMELA studies in the after-school mathematics clubs highlight some of the tensions around community knowledge and language choice—English or Spanish. Despite the tension, when doing mathematics we made an effort to promote the use of both Spanish and community contexts (Khisty and Willey 2008; Turner et al. 2009). These tensions point to the deep-rooted effects of a schooling process that devalues Latino children's language and culture. This is particularly true when restrictive language policies are in place. CEMELA has developed a research program that examines language policy and opportunity to learn mathematics. A discussion of this effort follows.

Placement in Mathematics Classes

Civil (2008b) presents a survey of the mathematics teaching and learning of immigrant students in different parts of the world. A point in common among mathematics teachers in many European countries, the United States, and Australia seems to be their view of language as a problem (i.e., students not knowing the language of instruction well), often conveying a deficit view of second-language learners. This contrasts with the call by researchers in mathematics education in multilingual contexts for the need to capitalize on the resources that multilingual students bring to the classroom (Moschkovich 2002). A focus on "language as an obstacle that has to be overcome" may lead to placement decisions that have implications for ELLs' academic advancement. Placing students in lower-level courses with the idea that first they need to learn the language is a practice that has serious equity implications. In her recommendations for the education of immigrant students, Valdés (2001) argues for the need for students to have access to the mainstream curriculum while they are learning English. As she writes, "[S]tudents should not be allowed to fall behind in subject-matter areas (e.g., mathematics, science) while they are learning English" (p. 153). Similarly, Callahan, Wilkinson, and Muller (2008, p. 181) write,

ESL [English as a Second Language] coursework is neither meant to replace, nor preclude access to, rigorous academic coursework; if it does, then it may seriously disrupt long-term academic trajectories. Mexican-origin students' access to academic content via course placement merits careful consideration.

This chapter will describe two different scenarios from our local context that point to a possible problem with how ELL students are sometimes placed into mathematics classes. Part of CEMELA's professional development work with teachers offered a series of mathematics content courses for middle school teachers from schools with large numbers of Latino and Latina students. For one session in one of those courses, a Chinese mathematics instructor conducted

a lesson on area and perimeter in Chinese. The goal was to have the teachers experience being second-language learners in a mathematics class (for details, see Anhalt, Ondrus, and Horak [2007]). During the debriefing, one teacher shared how she had basically ignored the language and focused on the mathematics because she was familiar with the content. This made her question her school's placement policy, which had placed some ELL students in mathematics classes below their perceived math skills and understandings (Anhalt, Ondrus, and Horak 2007, p. 22):

The thinking behind this placement policy is that the students will learn English through the mathematics content they already know. [The teacher] pointed out that based on her experience during the Chinese lesson, these students could very possibly be ignoring the English language completely during instruction, just as she ignored the Chinese language. Further, she pointed out that the students might be bored because the lower-level mathematics was too easy for them. She wondered if ... school systems are doing students a disservice in both their English language development and mathematics learning.

The second scenario is from CEMELA's work with parents. One of the goals is understanding how immigrant parents perceive their children's mathematics education, and their schooling in general, in the United States. One recurrent theme in the data is parents' perception that the mathematics level is higher in Mexico than in their children's current U.S. school (Civil and Planas 2010). This was true of Emilia and her son, Alberto: they both commented that what he was studying in U.S. sixth grade, he had already studied before in Mexico (Civil 2008a). In March 2006, the mother said,

What I feel is that they teach them more things there [in Mexico]. Now the difference here is that you have the language, ... and so for them it's perfect what they are teaching them because in this way it's going to help them grasp it, to get to the level, because for them, with the lack in English that they have, ... if they give them all the information... too much teaching during this period, to tell you the truth, it would disorient them more. Right now, what he is learning, what I see is that it's things that he had already seen, but if he gets stuck, it's because of the language, but he doesn't get stuck because of lack of knowledge.

Emilia seems to be fine with the fact that her child may be seeing content that he already knows, because she thinks that the priority at this stage is for her son to learn English. Later in the interview she makes a very insightful observation:

What I see is that on their homework assignment it says "grades 6–8." What I gather from this is that they are getting, I mean, that a child in grade 7 and one in grade 8, they are doing the same thing?

We interviewed Emilia again in December 2007; by then Alberto was in eighth grade and Carlos, her middle son, was in seventh grade. They both had the same teacher for mathematics, a teacher specifically assigned to the ELLs. Emilia said,

What I sometimes don't understand is why they give them the same homework if they are in different grades.... It bothers me a bit because it leads me to believe that, as if the eighth is at the same level as the seventh, you know? One assumes that the eighth is at a higher level.

Emilia captures quite well what CEMELA thinks is problematic about how ELLs are

being placed in mathematics classes. A focus on students' need to learn the language of instruction may be hampering their advancement in academic content areas such as mathematics. The implications of school language policies for students' placement in courses need to be examined and even confronted, because they may be obstacles to an equitable mathematics education (NCTM 2008).

Language, Mathematics, and Subtractive Schooling

This section will argue that restrictive language policy contributes to a classroom experience that inhibits growth in both mathematics learning and language development. CEMELA's research indicates that restrictive language policy is foundational to an educational experience that Valenzuela (1999) refers to as *subtractive schooling*. Giving a thorough account of Valenzuela's work on subtractive schooling is not possible. A central message from her work with immigrant Mexican and Mexican American students, however, is that for most of the high school students in her study, "schooling is a *subtractive* process. It divests these youth of important social and cultural resources, leaving them progressively vulnerable to academic failure" (p. 3). Valenzuela's ethnographic study of Seguin High School describes the consequences of this negation of cultural, social, and linguistic resources clearly (p. 62):

Rather than building on students' cultural, linguistic, and community-based knowledge, schools like Seguin typically subtract these resources. Psychic and emotional withdrawal from schooling are symptomatic of students' rejection of subtractive schooling and a curriculum they perceive as uninteresting, irrelevant, and test-driven.

Moll and Ruiz (2002) also use Valenzuela's (1999) concept of subtractive schooling and note how it is "a major feature of the education of poor and working-class Latino students all over the country. It results in disdain for what one knows and what one is, influences children's attitudes towards knowledge, and undermines their personal competence" (p. 365). CEMELA's work looks at how these subtractive schooling practices affect parents' and students' participation in mathematics teaching. What follows will provide one example of each.

Acosta-Irqui et al. (in press) illustrate the impact that different language policies have on parental participation in their children's mathematics education, particularly when the parents do not know English well. In our local context, evidence shows how the changes from bilingual education to English-only affected parents' support of their children with homework and with visits to their children's classrooms. More specifically, some parents stopped going to classrooms because they could not understand the instruction (Civil 2008a; Civil and Planas 2010). This is happening at the same time when schools feel pressure to increase parental involvement from legislation such as the No Child Left Behind Act. Although a description elsewhere has argued the need to expand the definition of parental engagement beyond parents' physical presence in schools (Civil and Andrade 2003), a concern persists that these restrictive language policies may alienate Latino, Spanish-speaking parents even more from schools. This alienation, in turn, feeds a common misperception among teachers and school administrators that "these parents don't care about their children's education." All the parents we have worked with *do* care immensely about their children's mathematics education and schooling in general. Some come to the

mathematics workshops we have offered to bridge that language gap and allow them to help their child. For example, Camelia and Marcos, the parents of a seventh grader, came to learn the mathematics in Spanish so that they could better support their daughter, even though the language difference was still an issue. In an April 2007 interview, they said the following:

- Camelia: If we work with her, here [at the school] they teach them in English, and when the girl is doing homework, we sit with her and it is in English, how can we help? [*raises her hands as if to indicate her frustration*]
- Marcos: It's in English. The problem is in English.
- Camelia: But not here [at the workshops]. Here we come, and you give it to us in Spanish. And it's the same that they do here [at school]. It is the same in English and in Spanish, the same fraction. But how can we help her if she counts in English, or ...?
- Marcos: Because for her [the daughter], the numbers, she knows them more in English than in Spanish.
- Camelia: That is, she knows the number in Spanish but since here they are not practicing them in Spanish, she ...
- Marcos: She forgets it.

This excerpt points to a particularly worrisome theme—the loss of the home language, or rather, the missed opportunity to learn not only English, but also academic Spanish. The home language in most of our cases is Spanish. Children such as Camelia and Marcos' daughter speak Spanish at home. Yet, the subtractive schooling practices (Valenzuela 1999) rob these children of the opportunity to learn two languages well, for social as well as academic communication. As Hernandez, Denton, and Macartney (2010, p. 22) write,

The vast majority of children in immigrant families are American citizens because they were born here, yet their diverse languages and emerging bilingualism represent an extraordinary cultural resource as the U.S. seeks to position itself in the increasingly competitive and multilingual global economy.

Children in contexts where restrictive language policies send them messages that their home language is not valued are missing a chance to become this “extraordinary cultural resource” that Hernandez, Denton, and Macartney (2010) mention.

Subtractive schooling does not just influence language development negatively; its supportive principle, restrictive language policy, links to mathematics classroom practices and opportunities to learn. To illustrate further how language policy affects participation in the classroom, consider the case of Carolina, who arrived in the United States from Mexico when she was in fifth grade. She was placed with a teacher who spoke Spanish. Mrs. Baker, herself a Mexican immigrant as a child, was teaching in a fourth- and fifth-grade SEI classroom. We determined, from her teacher's report, what we saw in the classroom, and Carolina's self-report in an interview, that Carolina's level of mathematics was quite good. Carolina told us that she had already

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learned earlier in Mexico most of what she was taught in U.S. fifth grade.

Mrs. Baker told us the following in a November 2005 interview:

Well, you know with Carolina, she is very smart. She picks up stuff right away. Those are things that I notice. Like she knows her facts, multiplication. And I told the kids "next week we are going to start off with division," because I haven't done that yet. And she and Delia [a student who had arrived from Mexico the year before] were the ones that said, "Oh, I understand, know my facts, I already know how to do the division." So hopefully the two can be models to the other ones.

Mrs. Baker shared with us, and we confirmed through classroom observations, that she relied on Delia to translate for Carolina. When working in small groups, Carolina could participate. She could use Spanish, and in many instances children in her group could follow it, since several children at that school are bilingual. But in whole-class discussion Carolina hardly ever said anything, because most of the instruction was in English. Mrs. Baker was certainly aware of and frustrated by this situation. She said, "I feel that I'm not giving her [Carolina] that attention, that instruction that I am supposed to be giving her because she is the only one who can't speak English."

Managing mathematical discourse in two languages is not an easy task; a culture in which using both languages is not the norm makes this task even harder. Mrs. Baker tried to involve Carolina in the whole-class discussion by translating into Spanish and inviting her to participate. Mrs. Baker, however, like other bilingual teachers we observed, had to make a conscious effort to remember to translate. Because the current language policy discourages using Spanish, whole-class discussions quite often are only in English. During an interview, Mrs. Baker expressed frustration at being underused, a bilingual teacher working in an educational setting where policy severely restricts her skills and understandings as a bilingual expert. An environment that does not nurture both—or all—languages present can make even small-group communication problematic.

In the episode described below, Carolina, the fifth grader; Griselda, a fourth grader and Carolina's sister; Darla, a fourth grader who speaks only English; and Anthony, a bilingual fifth grader, are working on the question "What do you notice about the fractions $1/2$, $1/3$, $1/4$, $1/5$?" This question was preparation for a task where students had to determine whether those fractions would split a group of 12 balloons and then a group of 12 brownies. A chart on the board listed the fractions $1/2$, $1/3$, $1/4$, $1/5$, $1/6$, $1/8$, $1/10$, and $1/12$, and labeled two blank columns beside the list—one, balloons; the other, brownies. The teacher approached this group of four students.

1. Mrs. Baker: What do you notice about the fractions $1/2$, $1/3$, $1/4$, $1/5$? Look at the board.
2. Darla: But what if they [*referring to Carolina and Griselda*] want to say something, and we don't understand.
3. Mrs. Baker: Well, he [Anthony] can translate for you.
4. Darla: OK.

Civil (2008c) presents more details on this case and, in particular, points out how difficult it

was for Anthony to translate in a mathematical context. Once again, we see the missed opportunity to develop students' academic Spanish. Through the first part of this group's interaction, Griselda is dominating the conversation, but what she is trying to say is not clear from a mathematical point of view. Her sister, Carolina, finally intervenes and explains that the fractions, from $1/2$ to $1/12$, are getting smaller.

1. Carolina: Un medio. Cada vez se va haciendo más chico. [One half. Each time it's getting smaller.]
2. Griselda: Se está haciendo más grande. [It is getting bigger.]
3. Carolina: Griselda, estoy hablando. No digas más grande. Se hace más chiquito porque un medio es más grande y un tercio es más chiquito. El número, el numerador de abajo quiere decir que cada [vez] se va haciendo más y más... ¿cómo se dice ... más ...? [Griselda, I'm talking. Don't say it's bigger. It gets smaller because one half is bigger and one third is much smaller. The number, the numerator on the bottom means that each [time it] gets more and more ... how do you say ... more ...?]
4. Anthony: ¿Largo? [Bigger?]
5. Carolina: No, más chico. Pues si es un [pause] doce, es algo muy chiquito, como así (*gesturing with her hands, showing a small separation*) y un medio es algo grandote. El numerador más bajo es más grande y el numerador más grande es más ... más poquito. Menos cantidad. [No, smaller. So if it's one twelve, it's something really small, like this (*gesturing with her hands*) and one half is huge. The lowest numerator is bigger and the largest numerator is more ... it is smaller. Less quantity.]
6. Darla: I have to learn Spanish.

This episode demonstrates several issues. Carolina seems to understand that as the denominator gets larger, the fraction gets smaller, but she first uses *number* (número, line 3 in the immediately previous dialog), and then switches to *numerator* (numerador), which she keeps for the rest of the dialogue, although she refers to the *numerator on the bottom* (el numerador de abajo). When she cannot think of the Spanish word for *smaller*, Anthony (line 4) provides *largo* (bigger), which makes us wonder what he understands, both mathematically and linguistically, from what Carolina just said. Carolina's gestures and sentences (line 5), although incorrect in her use of *numerator*, point to an understanding of what is going on with the fractions. Anthony does not offer any useful translation in this episode, which leads to Darla's comment in line 6, "I have to learn Spanish."

What did each student in this group learn about mathematics as he or she worked on this task? Carolina seemed to have a good command of fractions. Did she have an opportunity to share her knowledge with the whole class? What do teachers need to know about students like Carolina and Griselda to encourage their participation in the mathematics classroom?

Overall, most teachers with whom CEMELA has worked use group work in their approach

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to mathematics instruction. In many instances, they also used standards-based curricula (e.g., Investigations, Connected Mathematics). Students thus had an opportunity to engage in mathematical communication. In their small groups they often used both languages, English and Spanish. The issue remains, however, of how to engage ELLs in a contradictory environment. On the one hand, their home language is very present—at home, in the community, and even in the school. On the other hand, state policy sends a clear message that English is the language to be used in academic contexts, and teachers are reluctant to use a language other than English for fear of being reprimanded. Monitoring small-group discussions for mathematical learning and accuracy is not easy, because the teacher needs to distribute her time among the different groups. In most instances, the only language in the whole-class discussion was English, which did not allow us to see what would have been said if both languages were used.

The next and final section focuses on one experience in which we often used both languages, in small groups *and* with the whole class. Although this may have seemed an ideal situation, the segregated environment in which it happened underscores the complexity of language ideology.

The Complexity of Language Ideology in a Mathematics Classroom

In 2006, to further compound the restrictive effects of Proposition 203, the Arizona state legislature passed H.B. 2064, a new law that increased state funding to public school districts that serve English language learners. In order to qualify for the funds, however, the law required that districts place their ELLs in a segregated, four-hour, daily English block on grammar, reading, vocabulary, and writing, separate from their non-ELL peers. As of this writing, if the districts in this study wanted the state funding that the law offered, they have had no choice but to implement this model.

During the 2007–08 academic year, one of the middle schools where CEMELA conducted research initiated a program very similar to H.B. 2064's four-hour model. All the school's ELL students had five to six of their seven classes together in a specific section, hereafter called Section A. The program was designed to place students in smaller groups where teachers could, in theory, better address their needs as language learners.

The experience was reminiscent of Valdés's (2001) two schools in one building. From November 2007 to the end of the school year in May 2008, the author worked regularly with a seventh-grade class that had only eight ELL students, seven boys and a girl. Seven of the students were recent immigrants from Mexico, and most of them had arrived as fifth graders. The mathematics teacher was also from Mexico and an English language learner. The teacher taught mostly in English and used Spanish for clarification, usually in the small groups. The books and any handouts were in English, although the teacher had one set of textbooks in Spanish.

From a research perspective, I found the situation somewhat puzzling, because I wanted to focus on these students' understanding of mathematics and the language issue was a limitation. We were all native speakers of Spanish using English to communicate. I tended to use both languages, sometimes saying something in one language and repeating it in the other. As time went on in this class, the teacher and I developed the classroom norm that students were expected to explain their work. We were constantly asking students to justify their claims. Although most of the work was in small groups, we also asked students to present to the whole class from time to

time. We let the students use whatever language they wanted, and we—I more than the teacher—did the same thing.

One of the first times that we asked groups to present their work to the whole class happened in March 2008. The students had been working on one of the activities in the Filling and Wrapping unit (Lappan et al. 2006). They had made triangular, square, pentagonal, and hexagonal prisms and a cylinder, each using one sheet of paper. The task was to find the volume of each of these objects by filling them with two-centimeter cubes and then comparing their volumes. One pair of students, Carlos and Larissa, had actually figured out the volume in cubic centimeters by multiplying the number of cubes by eight. Thus their answers—and most important, their approach—were quite different from those of the other students who had counted the number of cubes and recorded that number as the volume. We asked these two students to present to the whole class.

1. Larissa: First, then we (pause) make the base and measured with how many cubes are ...?
2. Carlos: Cubes.
3. Larissa: Cubes are could be ..., be filled ..., filled.
4. Carlos: Filled.
5. Larissa: Yeah. Sigue tú, ya, sigue tú. [Yeah. You go on, go on.] (*Looks down*)
6. Carlos: And then, ¿luego qué hicimos? [And then what did we do?] (*Carlos and Larissa whispering to each other*)
7. Larissa: Sacamos, sacamos el, sacamos el volumen. [We found, we found the volume.]
8. Carlos: We get the volume of centimeter and (pause) because one cube, an example, (*grabs and holds up a cube*) one cube, uh have eight centimeter.
9. Larissa: Eight centimeter ... of the volume.
10. Carlos: So, it's, like example, here are like fourteen cubes so we multiply uh, fourteen times eight and then you get (*Looks at Larissa*)
11. Larissa: How many cubes.
12. Carlos: How many ... the volume. (*Puts the cube back in the bucket*)
13. Carlos: Uh. ¿Lo agarraron? [Uh, did you get it?] (*Smiles*)

Carlos's and Larissa's nonverbal behavior while presenting is hard to convey in writing. They appear nervous—several instances of nervous laughter throughout, looking down at the floor, and so on. They look very tentative in their talk and whisper to each other. The key to their mathematical explanation is in lines 8–12, when Carlos takes a sample cube and says that it is eight centimeters. (It should have been eight cubic centimeters.) Then in line 10, he talks about multiplying the number of cubes by eight to get the volume. In line 13, Carlos asks the class if they “got it.” Most students do not answer; some say yes. I did not think the explanation was clear enough, and said, “I don’t think they got it.” Carlos then asks if he can explain it in Spanish.

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1. Carlos: ¿Lo puedo explicar en español? [May I explain it in Spanish?]
2. Carlos: ¿Para que lo agarren mejor? [So they can understand it better?]
3. Author: Yeah, you can say it in Spanish.
4. Carlos: ¿Sí? Mira, entonces por ejemplo aquí caben once cubos. (*Holds up cube and points to the base of the triangular prism*) [Yeah? Look, so for example eleven cubes fit here.]
5. Larissa: En la base. [In the base.]
6. Carlos: Uh-huh, aquí en la base no más. Y cada cubo en centímetros, mide ocho. [Yeah, here in just the base. And each cube in centimeters is eight.]
7. Larissa: El volumen. [The volume.]
8. Carlos: El volumen. Entonces multiplicamos, once cubos que había por ocho. Y ahí va a acabar el resultado, de centímetros ... en cubos. ¿Ve? [The volume. Then we multiply, eleven cubes that were there by eight. And this is going to give us the result, in centimeters ... in cubes. You see?]

Certainly mathematical issues exist in this excerpt (e.g., the issue of units on lines 6 and 8, cubic centimeters versus centimeters), as well as in the rest of their explanation (e.g., mixing up measurements in centimeters with number of cubes). But I want to point out the difference in demeanor between the explanation in English and the one in Spanish presented above. During the one in Spanish, both students appear confident and smiling. Although one could argue that technically they were saying the same thing in both excerpts, this was not the impression one got when watching them. In the episode in Spanish, they were more engaging and appeared more in command of the problem. After the excerpt shown here, I intervened and redirected them to use the whiteboard and record their work in cubes first. All along, I asked them questions in English, but in a very simple, direct dialogue (e.g., "How many cubes did you get for the height of the prism?"). They successfully reached the point where they had a volume of 121 cubes, and then they multiplied by eight to get an answer in cubic centimeters. At this point, one student said, in Spanish, "One question; I don't understand the eight. Where does the eight come from?" This initiated one of the best mathematical discussions we had that year. Five of the students—Larissa, Carlos, and three others—were particularly engaged, arguing in Spanish. I only intervened minimally at the beginning and again toward the end to see if a sixth student understood the discussion.

I learned a lot from this experience, as from others later in the semester. Students who appeared not to be engaged all of a sudden participated because they enjoyed arguing in Spanish, as they said in later interviews. Thus, they could transfer their experiences with arguing to the mathematical classroom. Being able to do that in Spanish played a pivotal role, showing us students' mathematical thinking in ways could not have happened had we limited ourselves only to English. We could also push these students mathematically in ways that did not go unnoticed. For example, Carlos noted in an interview that in other classes, when they were done with their

work, they could go play on the computers, whereas in this class we always had them do mathematics and gave them more problems if they finished earlier. Carlos, Larissa, and another student from this class were placed in Algebra 1 in eighth grade.

Although our data supports the claim that these students engaged in mathematically rich discussions, and we believe that our ability to engage with them in Spanish and to let them use Spanish had a lot to do with this richness, the situation is much more complex than letting them use both languages. Interviews with the students—and in some instances, with parents—showed that these adolescents were very aware of their segregation in Section A (see Civil and Menéndez [2010]; Planas and Civil [2009]). Most of them expressed a desire to move out of Section A, and some believed that they were not learning as much English as they would if they were with the non-ELL students. Thus, in retrospect, it is not entirely clear that these students were necessarily comfortable with the idea of using Spanish in the mathematics classroom, since that may have contributed to their perception that they were not advancing enough in their English.

Closing Thoughts

This chapter underscores the complexity of the situation. If ELLs are in a class where English is the only language of instruction, the teacher may lose opportunities to gain more robust evidence of these students' mathematical understanding, as well as of areas where they need support. Insisting on English-only may limit their participation in small-group discussions, if they participate in class at all. Although segregating ELLs may increase their participation and allow teachers to learn more about the students' mathematical understanding by using more Spanish, the practice does not address all the students' needs, particularly the students' feelings about the segregation itself. Behind this oversight lie the messages sent by restrictive language policies such as Proposition 203, which make ELLs think that they are worth less because they do not know English well. Limited placement, limited participation, and segregation will not offer these students an equitable mathematics education.

This chapter highlights the need for a dialogue among policymakers, researchers, parents, teachers, and school administrators. One has to wonder about the motivation behind language policies that clearly affect Latino ELLs' opportunity to learn mathematics. Moll and Ruiz (2002) call for "educational sovereignty" as a way to challenge "the arbitrary authority of the white power structure to determine the essence of education for Latino students" (p. 368). Part of this educational sovereignty includes valuing Latino cultural, social, and linguistic backgrounds. CEMELA's research in classrooms and after-school settings calls for policymakers to address the impact of social bias toward bilingualism and toward Spanish as an important step toward improving Latinos' mathematics education. We should make efforts to recognize the negative cognitive, social, and psychological effects of subtractive-schooling approaches that restrict using students' first language and damp the positive cognitive effects of home-language maintenance.

What will it take for schools to build on the mathematical knowledge that ELLs have and to recognize the resources that ELLs bring by being bilingual and bicultural? Researchers and

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teacher educators need to do more in teachers' preparation and professional development programs, in order to engage in-service and preservice teachers in reflecting on the role of language and culture in mathematics teaching and learning with Latino and Latina students. Our work shows that engaging teachers in these conversations is not an easy task: teachers often turn to the culture of poverty to explain students' low achievement (Civil 2009). We need to provide more opportunities for teachers to appreciate and value the resources that bilingual students draw on when doing mathematics, that is, their use of their first language, gestures, and code switching (Zahner and Moschkovich, in press), as well as examples of ELLs' successful participation in mathematical discussions.

We also need to provide more opportunities for parents and teachers to interact in children's mathematics education in formats other than the parent-teacher conference. Many misperceptions occur between parents and teachers about their respective roles in the teaching and learning process. CEMELA's outreach to parents, in which we bring together preservice teachers, teachers, parents, children, and university researchers, allows for parents and teachers to learn from one another. Through these outreach efforts, teachers and school administrators can learn from the parents, not only about parents' expectations for their children's schooling but also parents' approaches to school mathematics and their uses of mathematics in everyday life. These opportunities for dialogue may improve communication around, for example, homework, and they may make parents and teachers more aware of issues such as placement. In these CEMELA opportunities, bilingualism becomes a tool to mediate learning, allowing parents to share the academic arena with their children. Although in Arizona English is the prevalent school language and Spanish may be the one in the home, workshops for parents and children show a back-and-forth between both languages, allowing a better understanding of reasons for language choice (Menéndez, Civil, and Mariño 2009). These activities with parents can offer in-service and preservice teachers ideas on how to build on their students' linguistic and cultural backgrounds, as well as how to challenge or expand their prior thinking about Latino parents and students. To quote a preservice teacher,

More than anything, I have learned about the parents. I never thought they would be so involved and dedicated to the education of their kids. Working with CEMELA has also made me realize the importance of culture and language and how key it is to the success of students. If they feel disconnected at all or out of place it obviously affects their education.

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